Appendix A:

Abstracts of two references cited in WO 01/96847, Zhou et al.

1) Abstract of Morales and Lieber, Science, 279, 209-211, 1998
2) Abstract of Zhang et al., Appl. Phys. Lett, 72, 15, 1835-1837, 1998

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REPORTS

A Laser Ablation Method for the Synthesis of Crystalline Semiconductor Nanowires

Alfredo M. Morales, Charles M. Lieber *

A method combining laser ablation cluster formation and vapor-liquid-solid (VLS) growth was developed for the synthesis of semiconductor nanowires. In this process, laser ablation was used to prepare nanometer-diameter catalyst clusters that define the size of wires produced by VLS growth. This approach was used to prepare bulk quantities of uniform single-crystal silicon and germanium nanowires with diameters of 6 to 20 and 3 to 9 nanometers, respectively, and lengths ranging from 1 to 30 micrometers. Studies carried out with different conditions and catalyst materials confirmed the central details of the growth mechanism and suggest that well-established phase diagrams can be used to predict rationally catalyst materials and growth conditions for the preparation of nanowires.

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Silicon nanowires prepared by laser ablation at high temperature

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Silicon nanowires have been synthesized in high yield and high purity by using a high-temperature laser-ablation method with growth rates ranging from 10 to 80 μm/h. Transmission electron microscopic investigation shows that the nanowires are crystalline Si, and have diameters ranging from 3 to 43 nm and length up to a few hundreds microns. Twins and stacking faults have been observed in the Si core of the nanowires. The lattice structure and constant of the nanowires as determined from x-ray diffraction (XRD) are nearly identical to those of bulk Si, although the relative XRD peak intensities are different from those of randomly oriented Si crystallites. Raman scattering from the nanowires shows an asymmetric peak at the same position as that of bulk crystalline silicon.

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Keywords

silicon, elemental semiconductors, semiconductor quantum wires, nanostructured materials, pulsed laser deposition, stacking faults, twin boundaries, transmission electron microscopy, Raman spectra

PACS

- 81.05.Cy
  Materials science Specific materials: fabrication, treatment, testing, and analysis Elemental semiconductors
- 81.05.Ys
  Materials science Specific materials: fabrication, treatment, testing, and analysis Nanophase materials
- 81.15.Fg
  Materials science Methods of deposition of films and coatings; film growth and epitaxy Laser deposition
- 68.55.Jk
  Surfaces and interfaces; thin films and whiskers (structure and nonelectronic properties) Thin film structure and morphology Structure and morphology; thickness
- 61.72.Nn
  Structure of solids and liquids; crystallography Defects and impurities in crystals; microstructure Stacking faults and other planar or extended defects
- 78.30.Am
  Optical properties, condensed-matter spectroscopy and other interactions of radiation and particles with condensed matter Infrared and Raman spectra Elemental semiconductors and insulators
- YEAR: 1998